Lanka Education and Research Network

Campus Network Design
the Sri Lankan approach
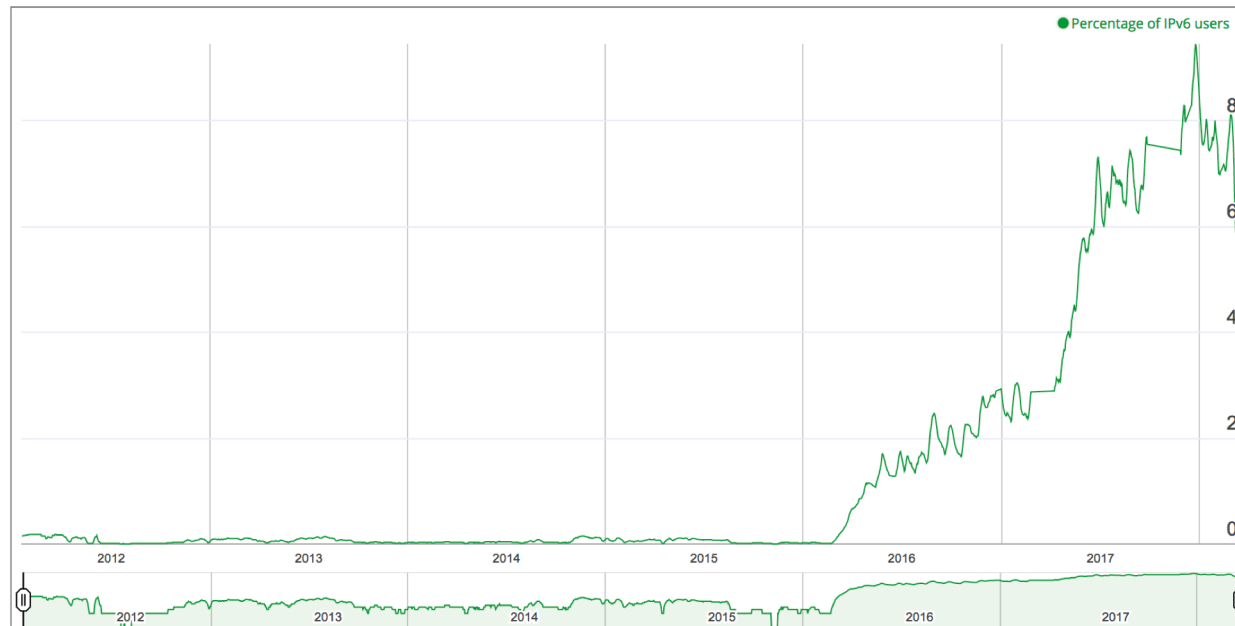
APAN IPv6 Working Group

29th March 2018

APAN 45 - Singapore

Thilina Pathirana

IPv6 from Sri Lankan view point

- In Sri Lanka, IPv6 started way back in 2008 when SLT upgraded their core to support their first IPv6 customer, LEARN.

- All commercial ISP's have upgraded and configured their Core networks with IPv6

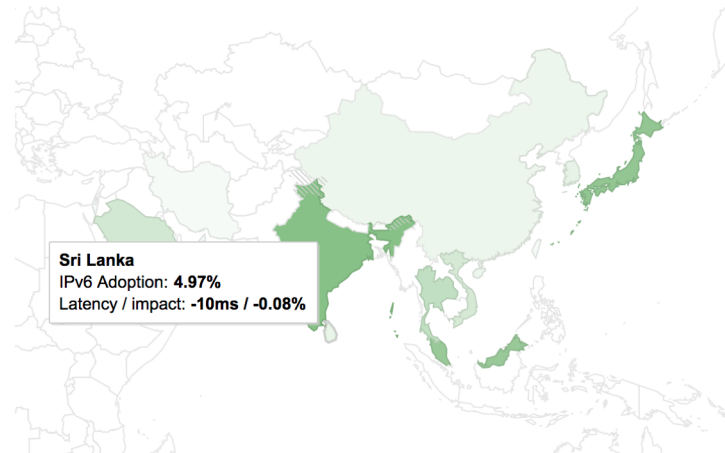- But only 2-3 Commercial ISP's provide IPv6 to end users

source: http://6lab.cisco.com/stats/cible.php?country=LK&option=all

National Research and Education Network of Sri Lanka

IPv6 from Sri Lankan view point

ASN	AS Name	IPv6 Capable	IPv6 Preferred	Samples
AS18001	DIALOG-AS Dialog Axiata PLC.	14.32%	14.01%	1,735,754
AS9329	SLTINT-AS-AP Sri Lanka Telecom Internet	0.04%	0.03%	1,048,813
AS45356	MOBITEL-LK IS Group, No108, W A D Ramanayake Mawatha	0.03%	0.01%	339,683
AS132045	AIRTEL-AS-ISP Bharti Airtel Lanka Pvt. Limited	0.01%	0.01%	221,275
AS17470	ETISALATLK-AS Etisalat Lanka (Pvt) Ltd.	0.01%	0.00%	168,217
AS132447	HUTCHISON-LK 234, Galle Road, Colombo 4	0.00%	0.00%	128,480
AS45224	BELLNET-AS-AP Lanka Bell Limited	0.01%	0.01%	67,553
AS38229	LEARN-LK Lanka Education Research Network, NREN	25.83%	16.26%	41,242
AS5087	LANKA-COM Lanka Communication Services	0.09%	0.09%	17,302
AS45489	SLT-GLOBAL Sri Lanka Telecom PLC, GLobal Peering	0.00%	0.00%	477
AS133051	CBOCP-AS-AP COMMERCIAL BANK OF CEYLON PLC	0.00%	0.00%	449
AS24222	OFFICETIGER-ANNANAGAR-INDIA-AS OFFICETIGER DATABASE SYSTEMS INDIA PVT LTD	0.00%	0.00%	370
AS4755	TATACOMM-AS TATA Communications formerly VSNL is Leading ISP	0.00%	0.00%	97
AS51964	ORANGE-BUSINESS-SERVICES-IPSN-ASN	0.00%	0.00%	31
AS136934	BOC-AS-AP Bank Of Ceylon	0.00%	0.00%	7
AS51964	ORANGE-BUSINESS-SERVICES-IPSN-ASN	0	0	31
AS136934	BOC-AS-AP Bank Of Ceylon	0	0	7

source: APNIC

Per-Country IPv6 adoption

Sri Lanka
IPv6 Adoption: **4.97%**
Latency / impact: **-10ms / -0.08%**

source: https://www.google.com/intl/en/ipv6/statistics.html

LEARN
National Research and Education Network of Sri Lanka

IPv6 and LEARN

- IPv6 peering with SLT since 2008-Oct.

- LEARN obtained provider free IPv6 2401:DD00::/32 from APNIC.

- Peering with TEIN3 since 2010.

- All Hosted Services are currently on Dual Stack.

- Member institutes are provided with /48 subnets.

- All institutional access routers except for few are IPv6 enabled

- More info:

  - http://www.learn.ac.lk/ipv6

10
Years

Executive Steps provided to LEARN customers

- Check whether your devices are IPv6 enabled
  - Today all new OS / HW are IPv6 Capable, please check with your vendors.

- Get your IPv6 range from LEARN (if haven't already)

- Create a suitable subnet plan which matches your existing topology
  - Try to stick with Dual Stack environment

- First configure Core network at your institute with ipv6

- Verify connectivity with Outside

- Configure internally hosted Servers (specially any DNS servers)

- Configure internal vlans

- Confirm End User Connectivity

LEARN *National Research and Education Network of Sri Lanka*

Campus Network Subnets

- Assume the IP range provided by LEARN as 2401:DD00:SSSS::/48
    (where SSSS can be any pre-defined 0-9,A-F characters)

- Subnetting 2401:DD00:SSSS::/48 into /64s gives 65536 subnets, that is a huge range.

- We will divide /48 into small aggregated units which can be distributed among Faculties, Buildings or Core devices.

- As a standard lets take 2401:DD00:SSSS:XXYY:: where XX represents a Core unit and YY represents a sub unit within that core.

- Then there are 256 /56 when we change XX, and each XX will contain another 256 /64's

- Eg: XX can be Faculties and YY can be departments in it.

Campus Network Subnets

- Example Subnet

| Faculty / Aggregation	Department	Vlan	Allocation
Faculty 1 2401:DD00:SSSS:1000::/52	Dept 1	10	2401:DD00:SSSS:1110::/64
	Dept 2 2401:DD00:SSSS:1200::/56	20	2401:DD00:SSSS:1220::/64
		21	2401:DD00:SSSS:1221::/64
Faculty 2 2401:DD00:SSSS:2000::/52	Dept 3	30	2401:DD00:SSSS:2330::/64
	Dept 4	40	2401:DD00:SSSS:2440::/64
Faculty 3 2401:DD00:SSSS:3000::/52	Dept 5	50	2401:DD00:SSSS:3550::/64
	Dept 6	60	2401:DD00:SSSS:3660::/64
Faculty 4 2401:DD00:SSSS:4000::/52	Dept 7	70	2401:DD00:SSSS:4770::/64
	Dept 8	80	2401:DD00:SSSS:4880::/64
Core Network	2401:DD00:SSSS:0000::/64 to 2401:DD00:SSSS:00FF::/64		

Campus Network Design cont…

- Always try to assign easy numbers that can be easily remembered

- Keep :ffff of last 4 nibbles for the gateway/vlan interfaces

- Remember to configure DNS otherwise your network will get slow.

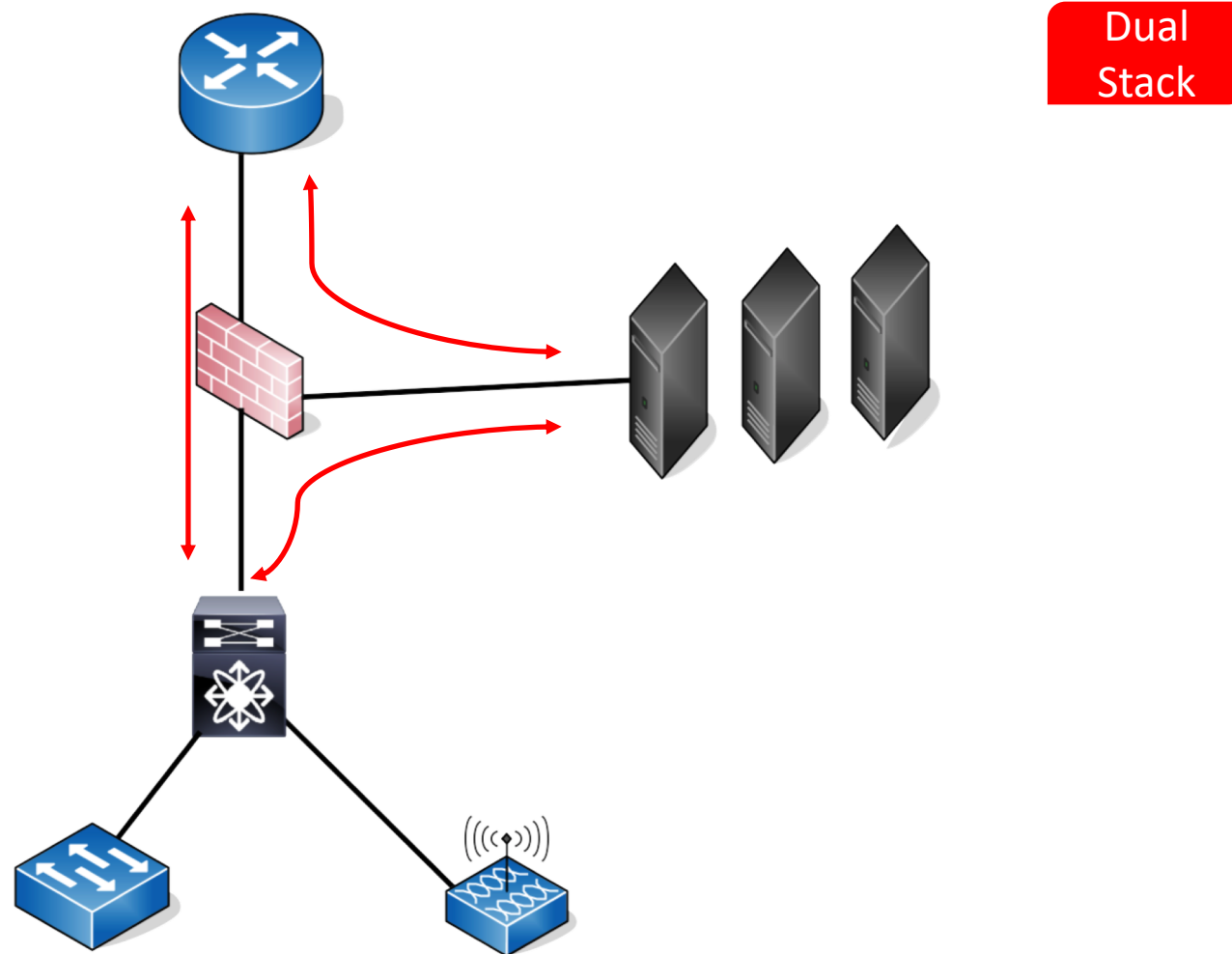- We still have time to go for Native IPv6 therefore master on Dual Stack
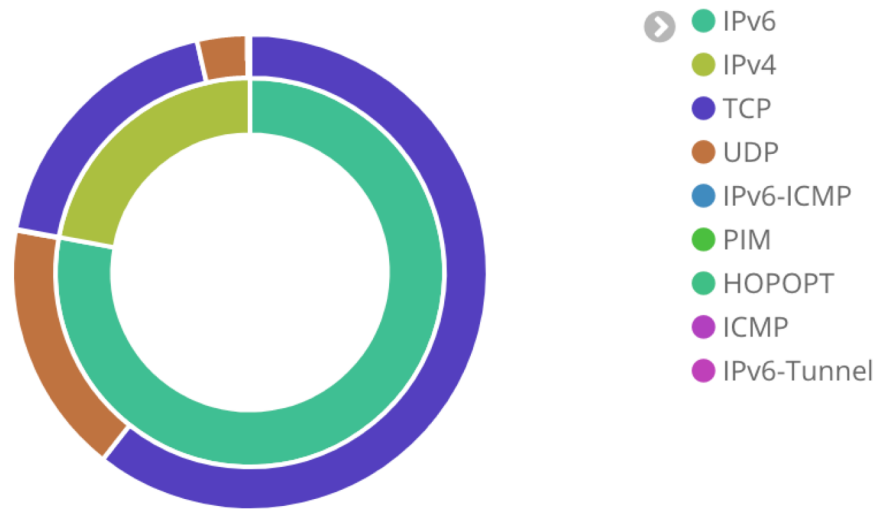
Campus Network Design cont…
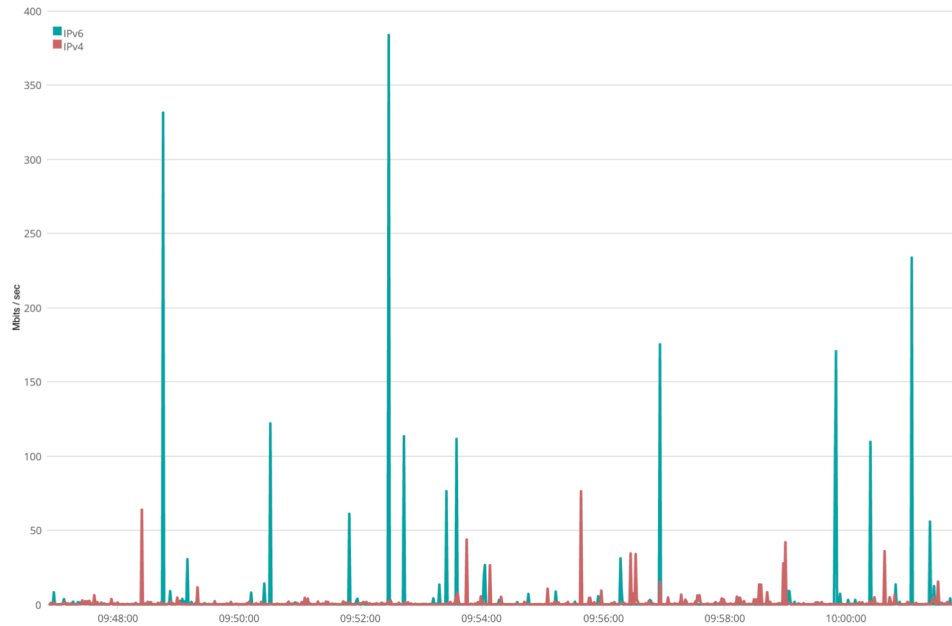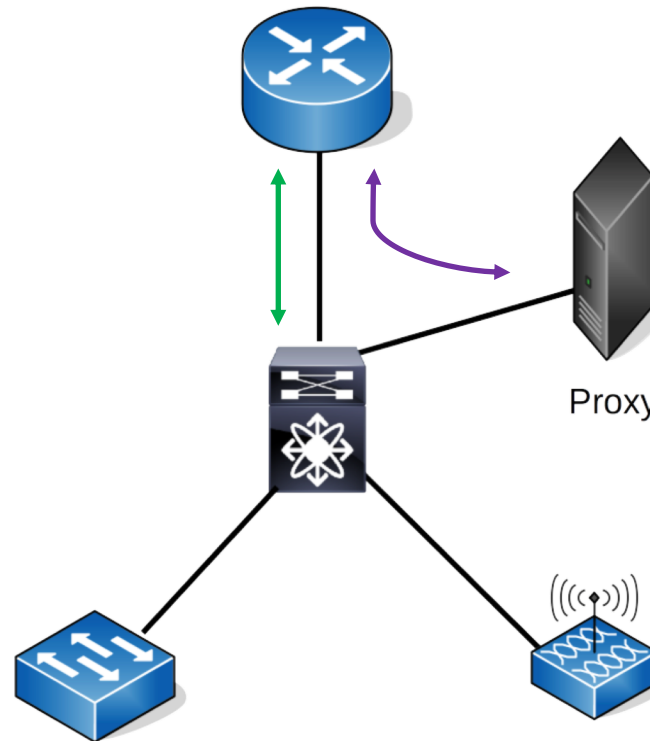

(Traffic to TEIN on off peak period)
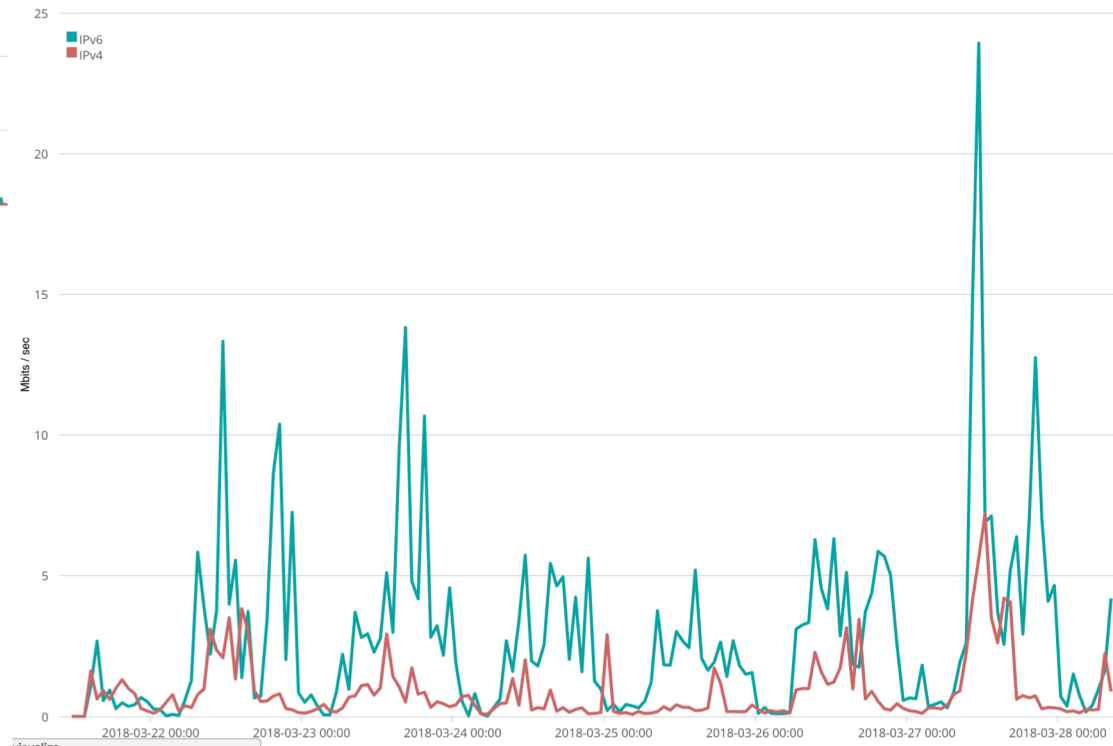
Campus Network Design – Topology 1
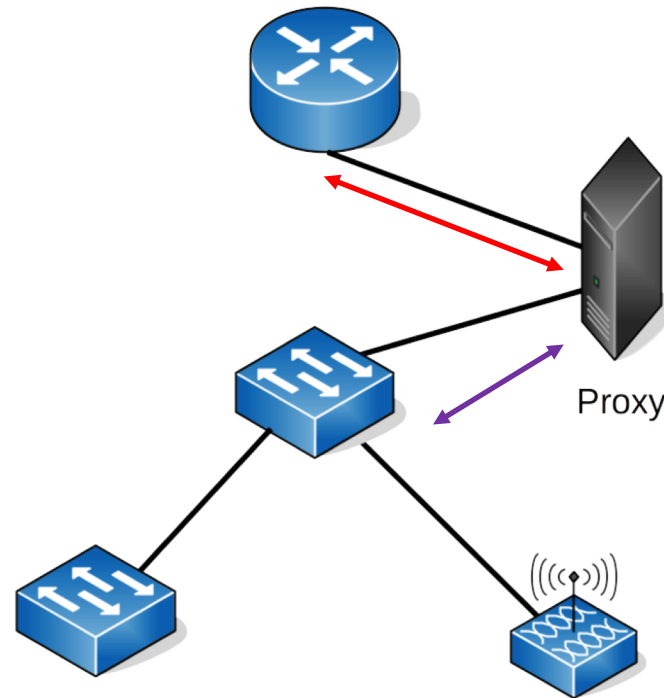
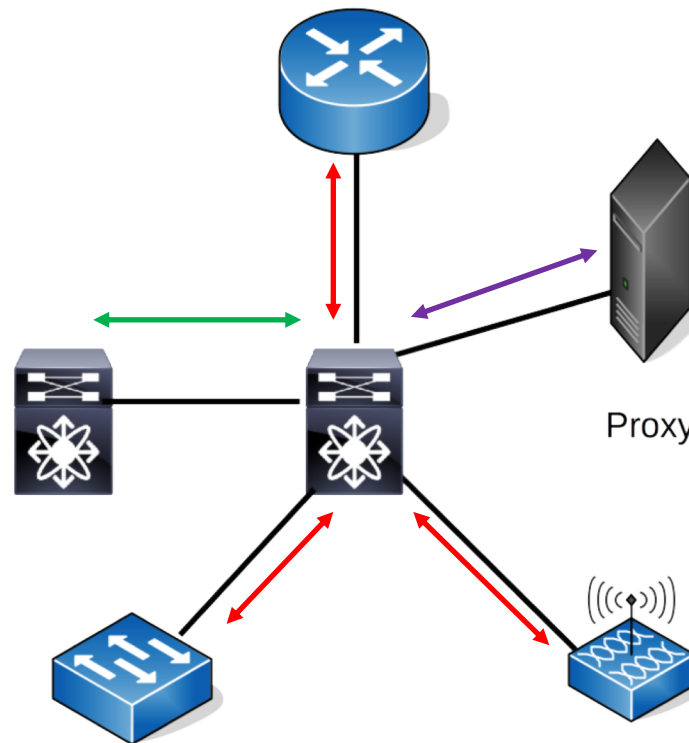Dual Stack

Campus Network Design – Topology 2

IPv6

IPv4

Proxy

Campus Network Design – Topology 3

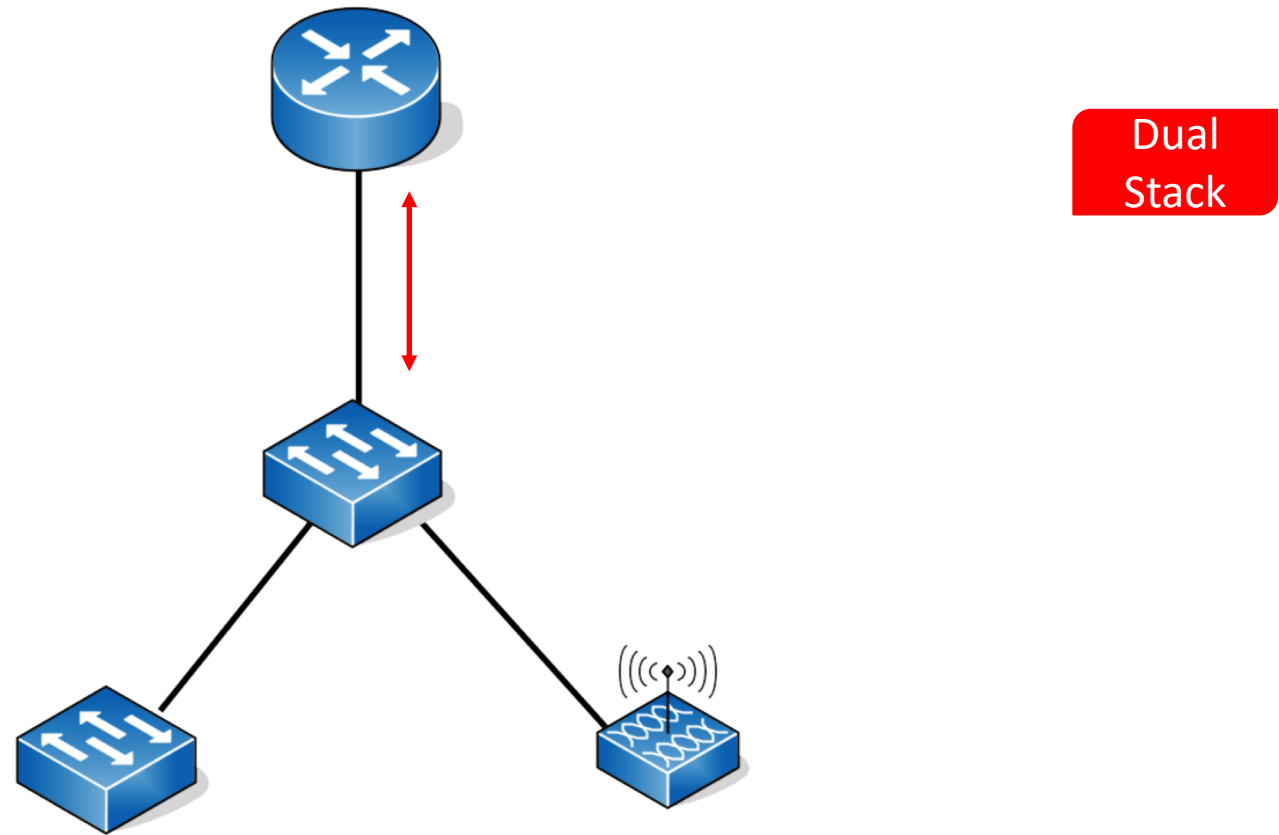Dual Stack

IPv4

Proxy

Campus Network Design – Topology 4

Campus Network Design – Topology 5

Dual Stack

Deployment Challenges

- Old Hardware Devices

- Reluctance to change

- Misunderstandings on technology

- Managements considering as non essential

How Challenges are met

- Workshops for technical persons

- Assistance through LEARN TAC

- Appreciation of Engineers

- Updating non-tech Managements

Future Plans

- Do more techy workshops

- Informational / Promotional Campaigns

- Special Sessions for Non Technical Managements

- Influence engineers to do more

- Give priority on IPv6 for new customers

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Thank You

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